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(54) **OVERMOLDED ACCESS PORT INCLUDING ANCHORING AND IDENTIFICATION FEATURES**

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See application file for complete search history.

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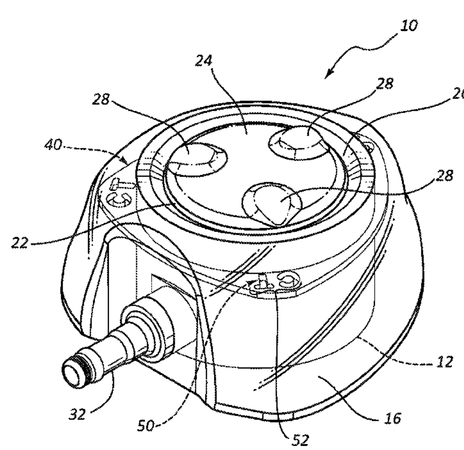
(57) **ABSTRACT**

An access port for providing subcutaneous access to a patient is disclosed. In one embodiment, the port includes an internal body defining a fluid cavity that is accessible via a septum. A compliant outer cover including silicone is disposed about at least a portion of the body. A flange is included with the port body and is covered by the outer cover. The flange radially extends about a perimeter of the port body proximate the septum so as to impede penetration of a needle substantially into the outer cover in instances where the needle misses the septum. The flange can further include both an anchoring feature for securing the outer cover to the port body and an identification feature observable via x-ray imaging technology for conveying information indicative of at least one attribute of the access port. The outer cover provides a suitable surface for application of an antimicrobial/antithrombotic coating.

9 Claims, 16 Drawing Sheets



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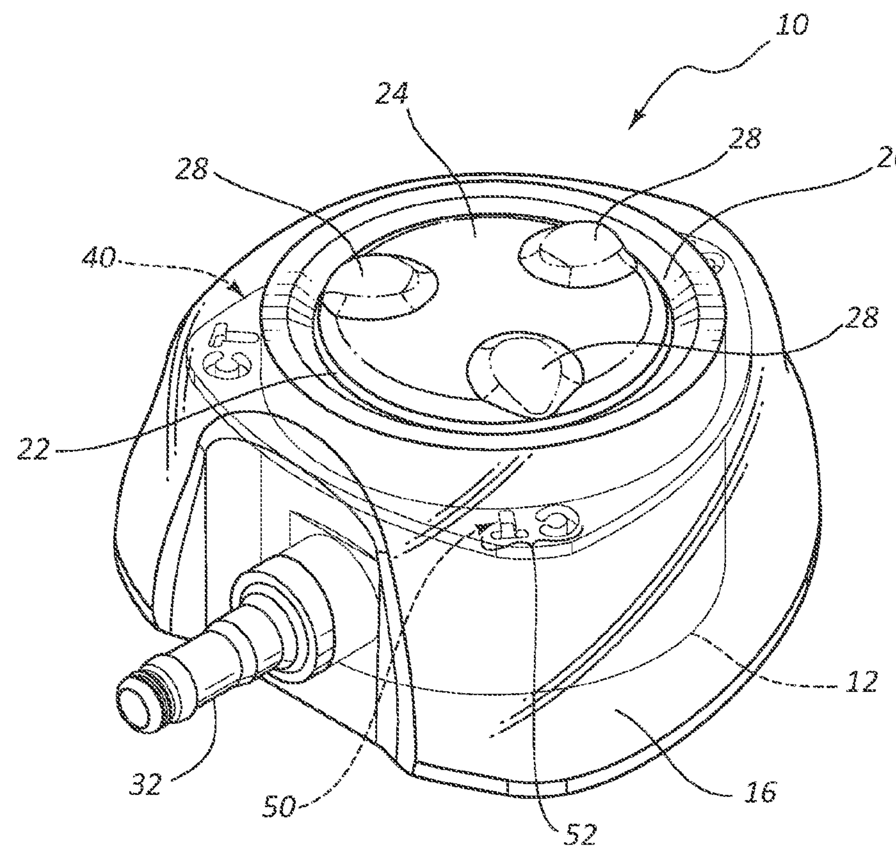
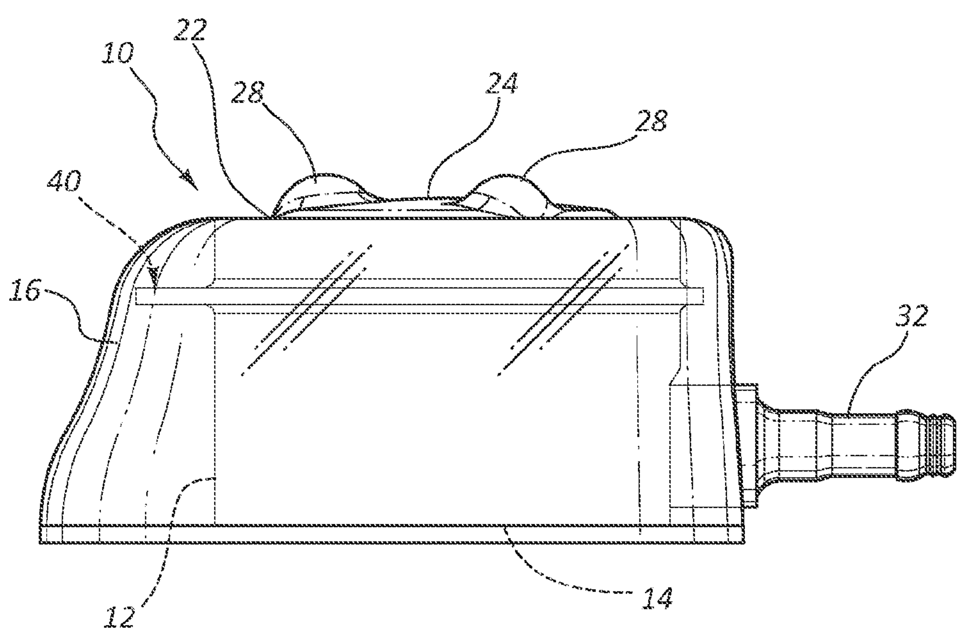


FIG. 1A



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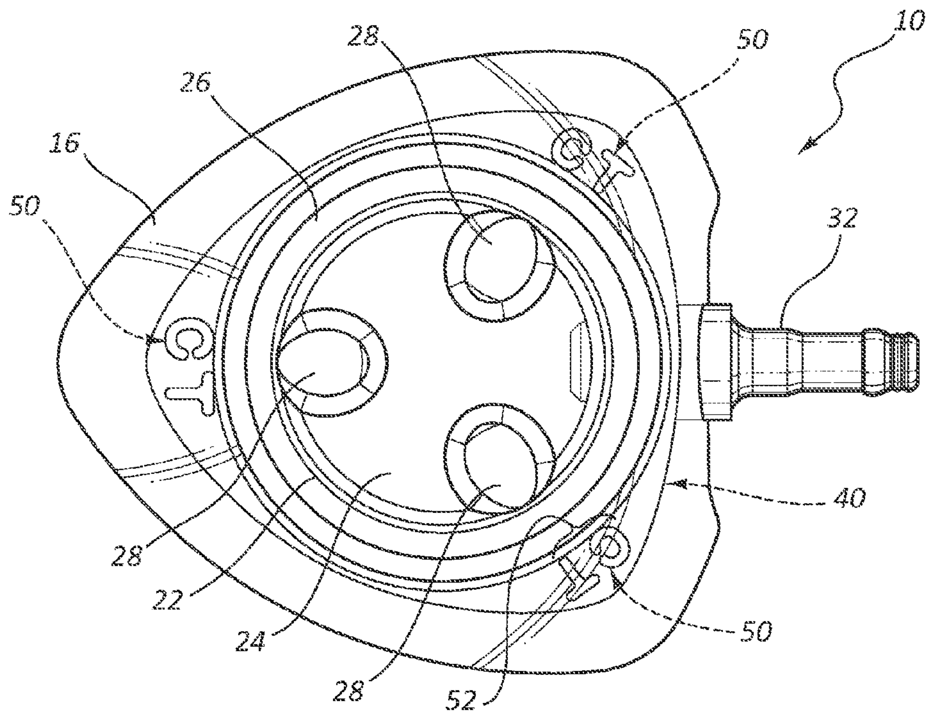
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FIG. 1C

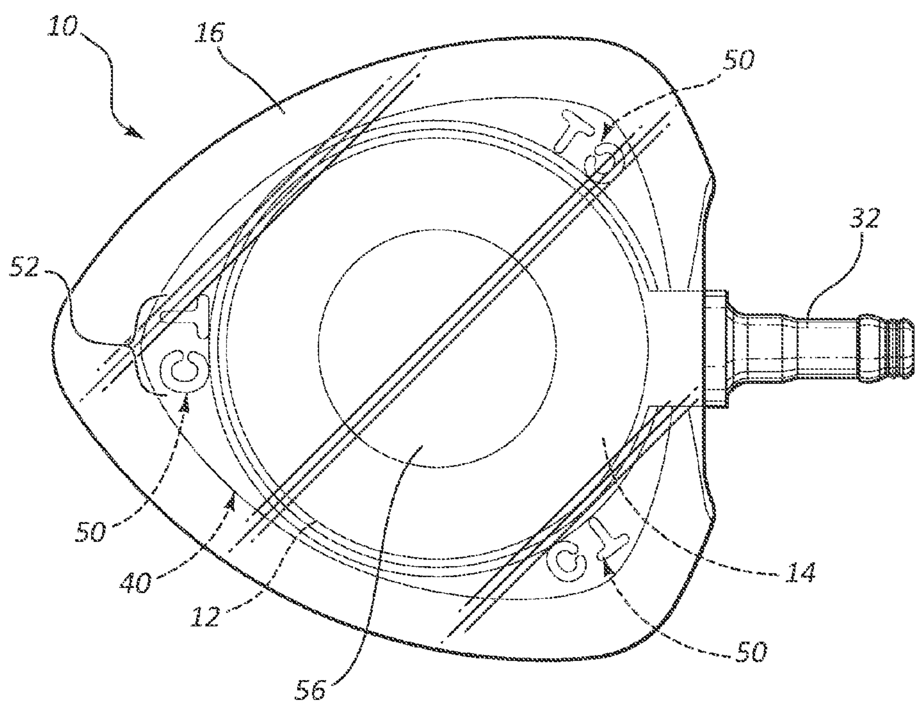
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FIG. 1D

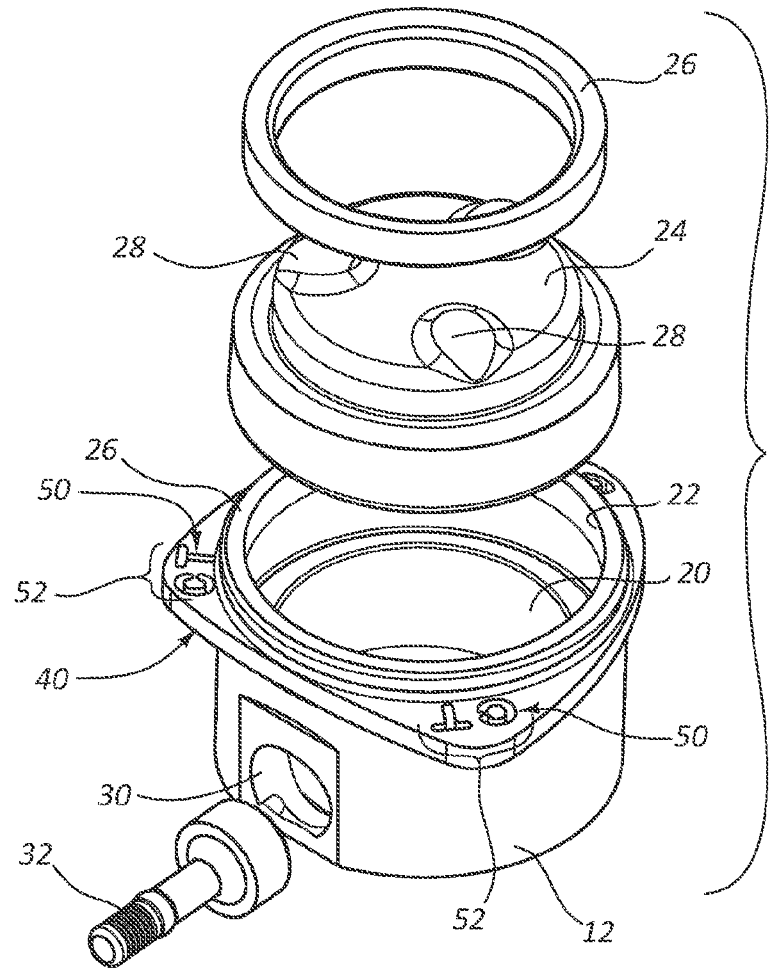
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FIG. 2A

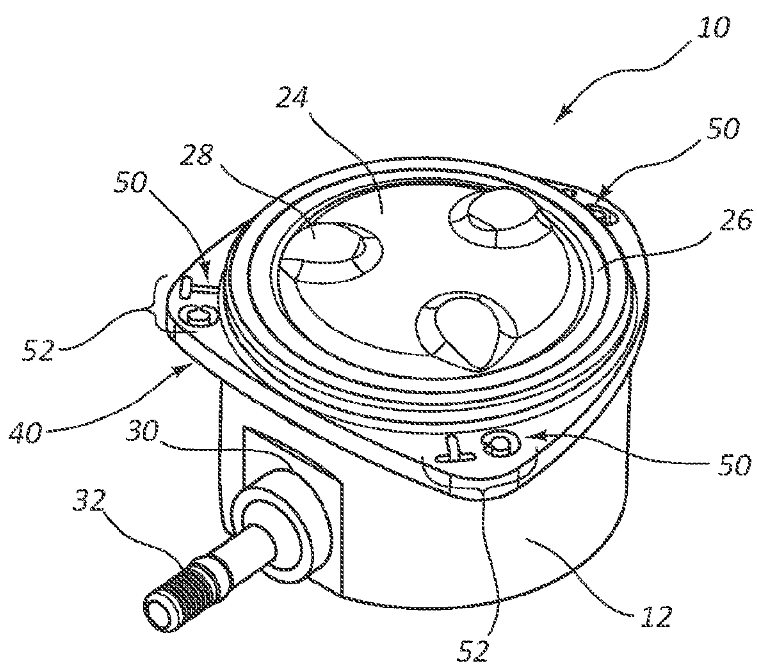
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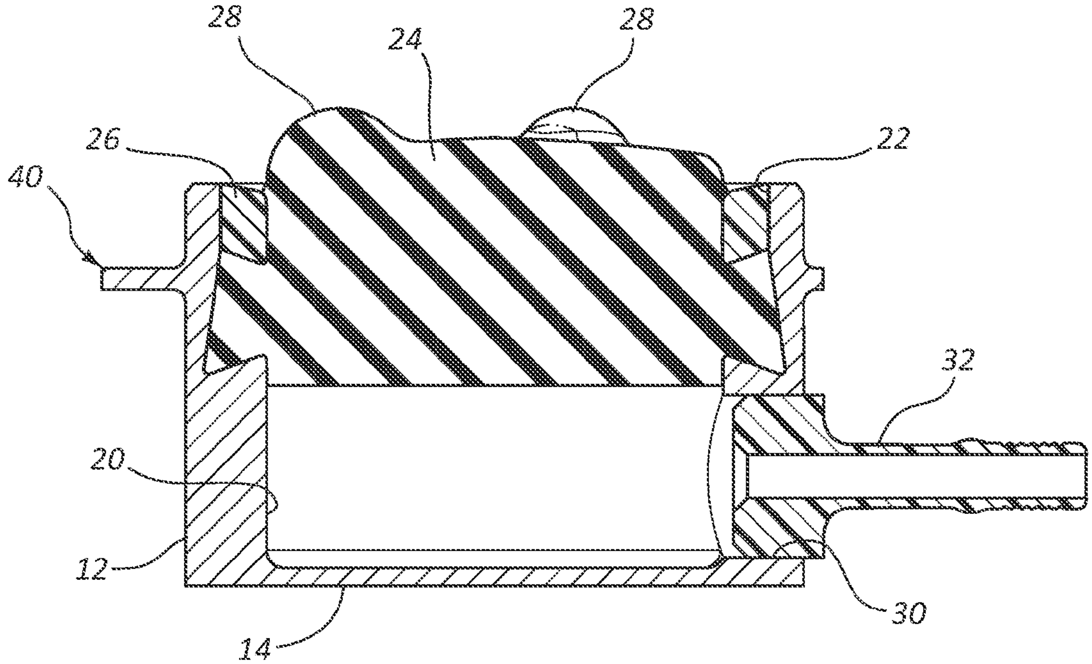
FIG. 2B



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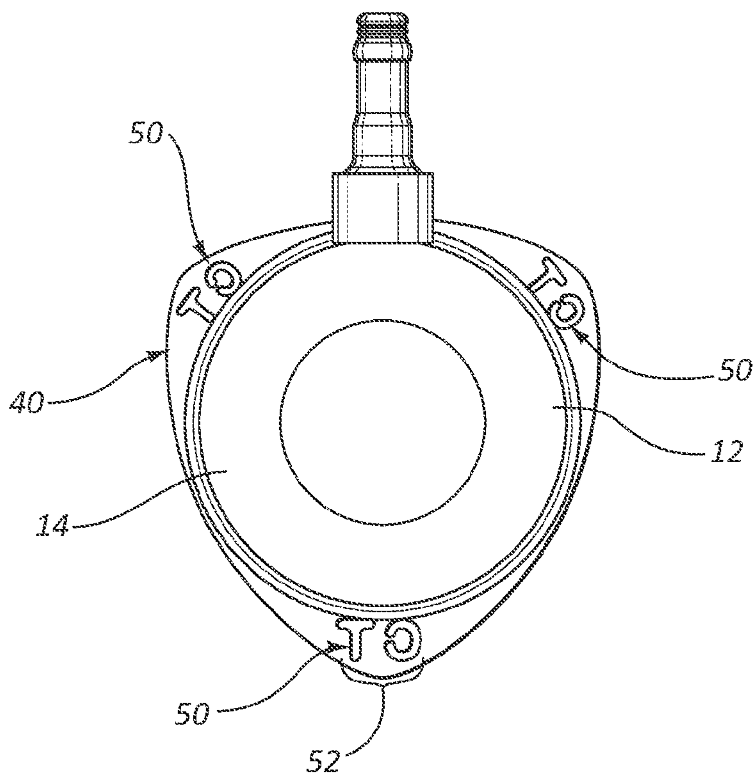

FIG. 2D

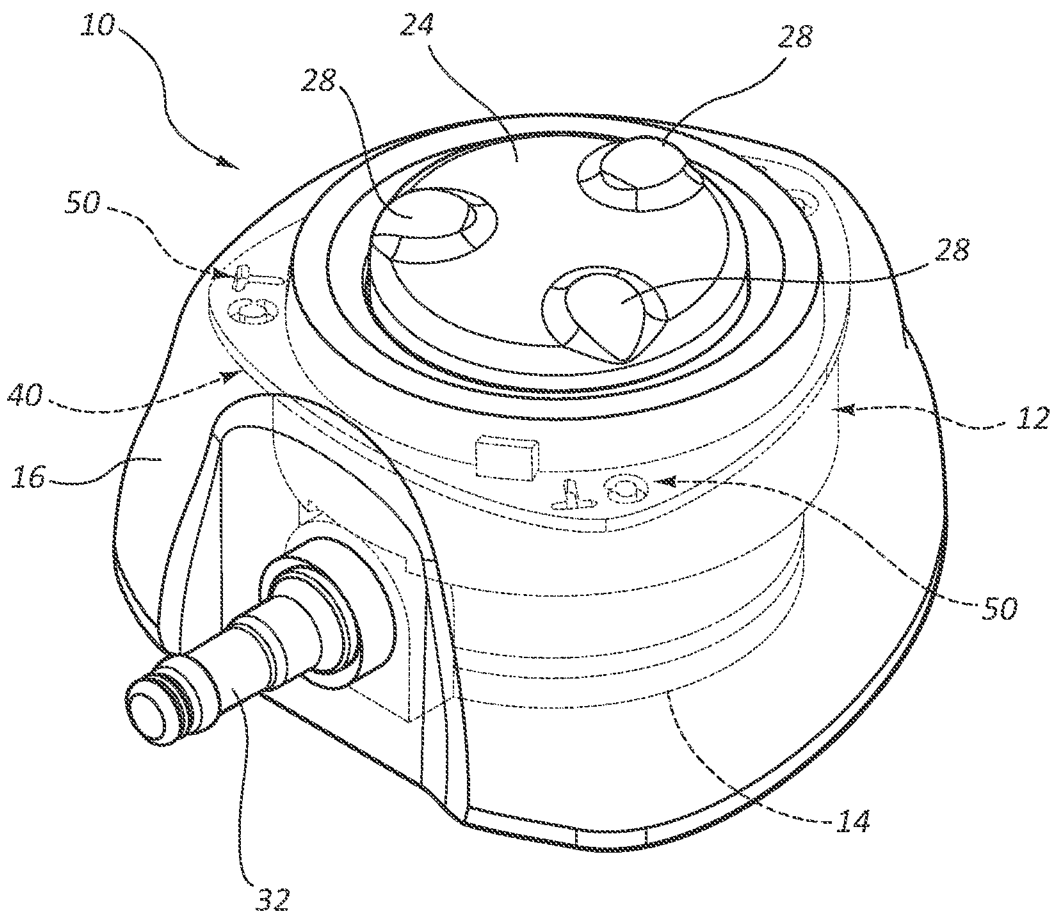

FIG. 3A

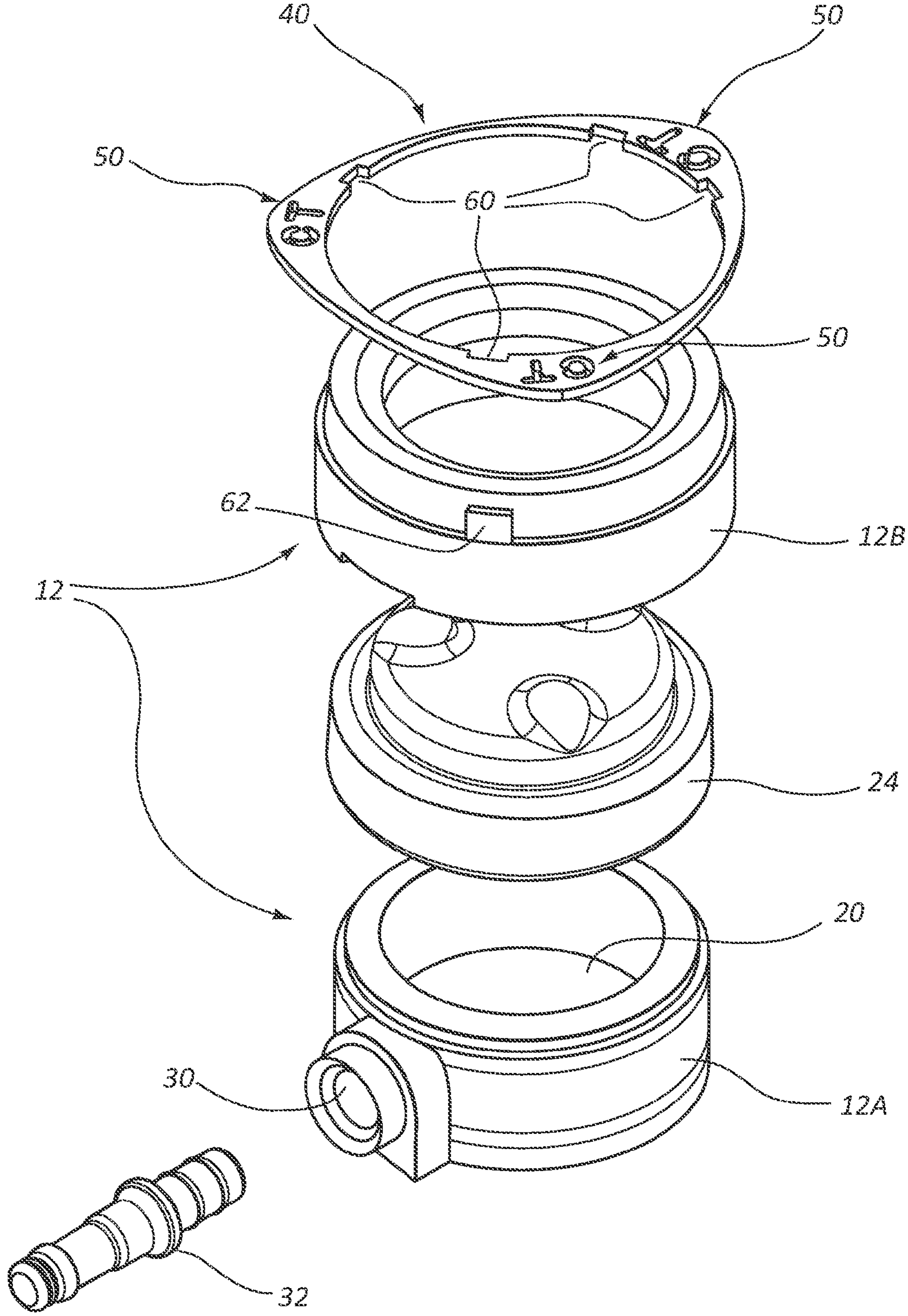

FIG. 3B

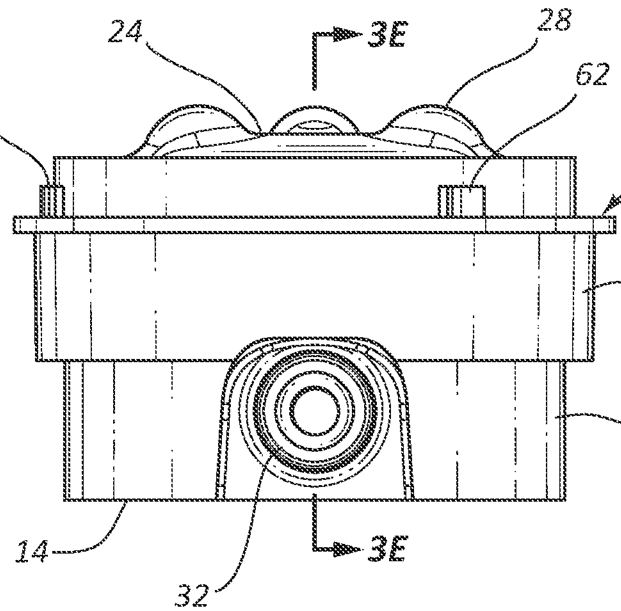
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FIG. 3C

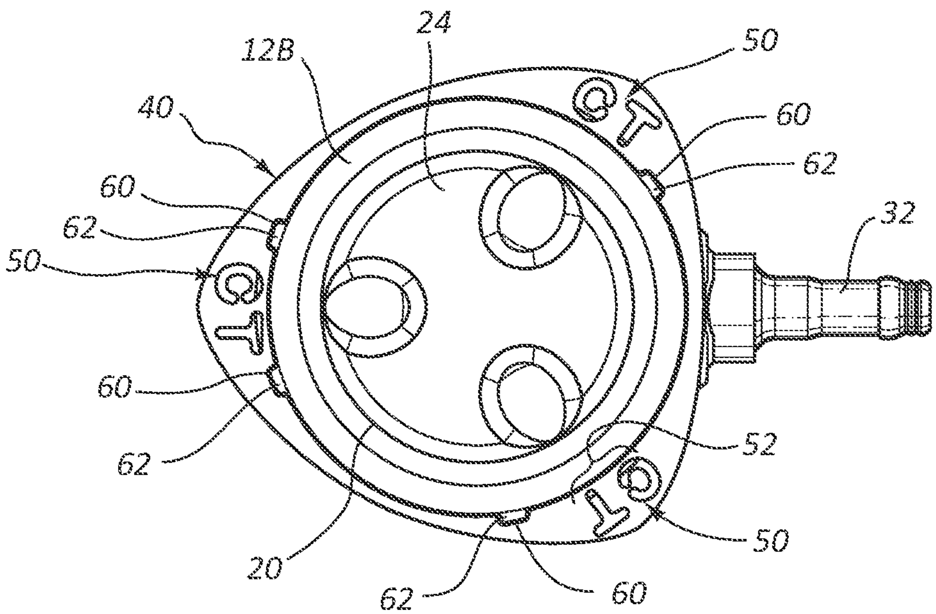
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FIG. 3D

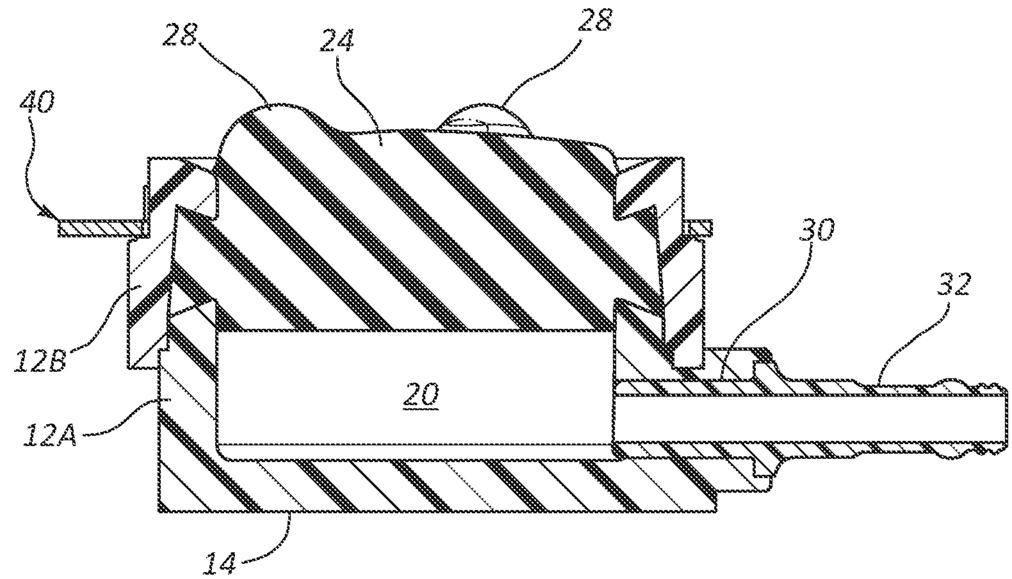

FIG. 3E

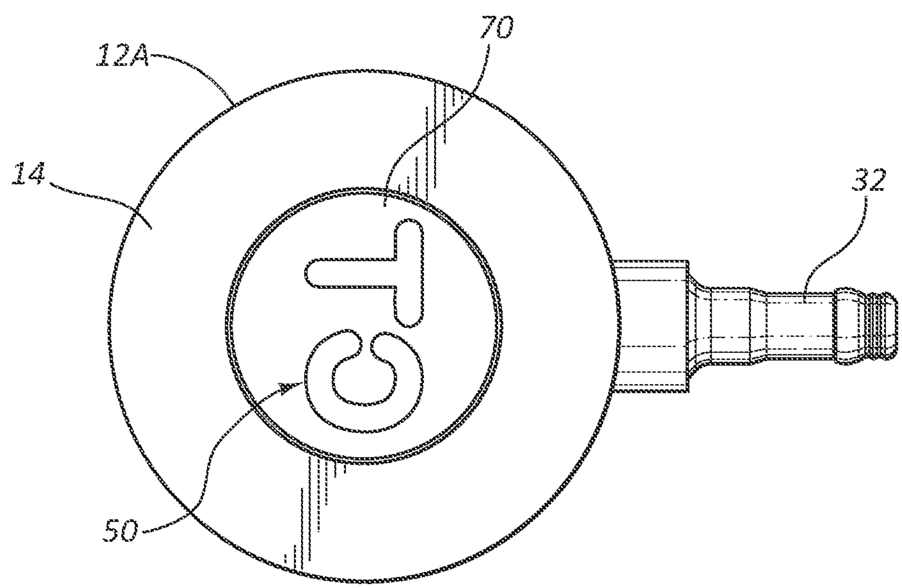

FIG. 3F

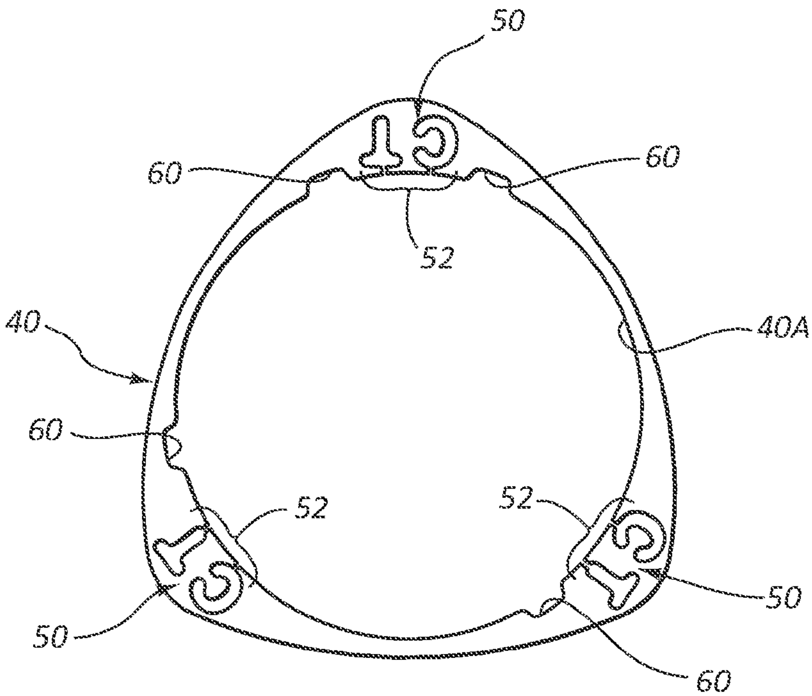
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FIG. 4

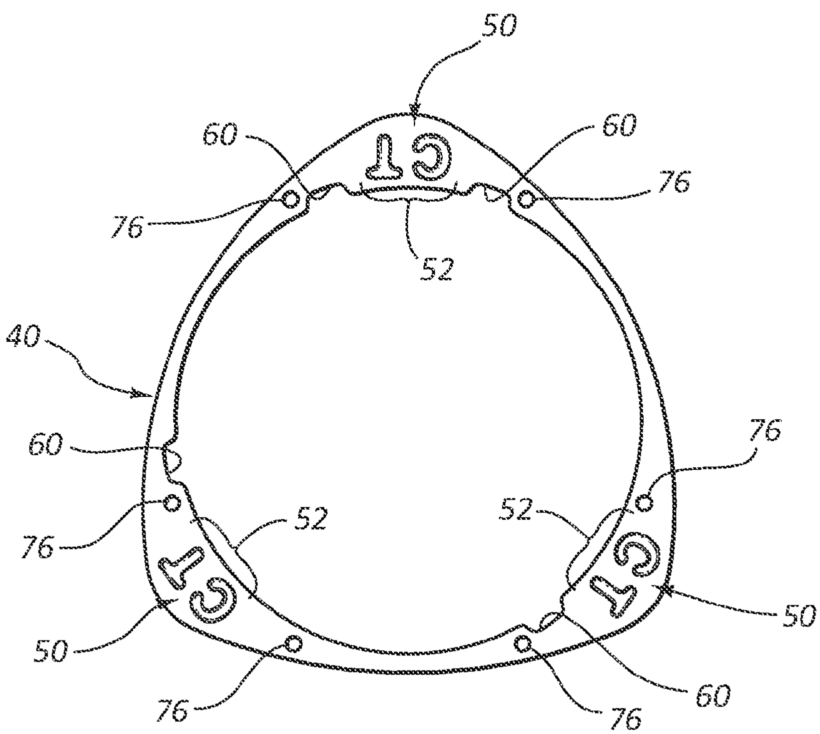
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FIG. 5

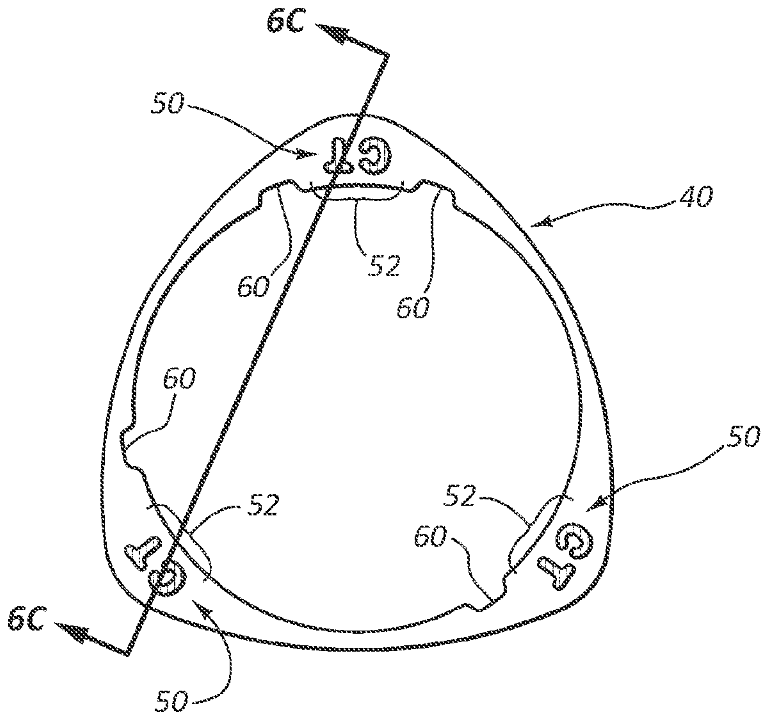

FIG. 6A

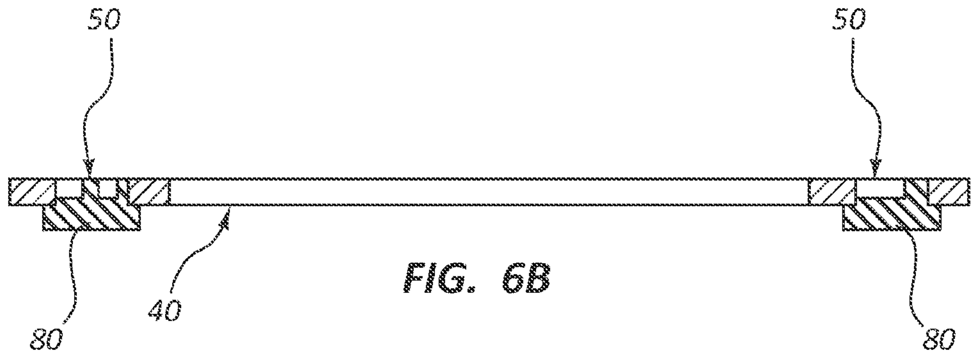

FIG. 6B

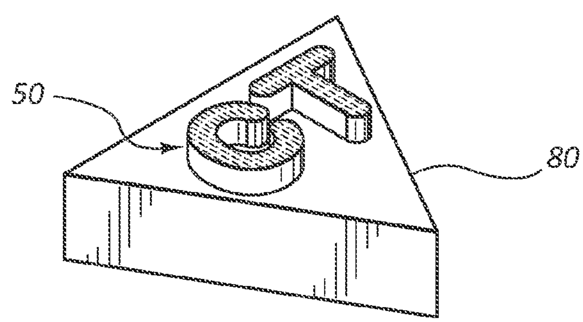

FIG. 6C

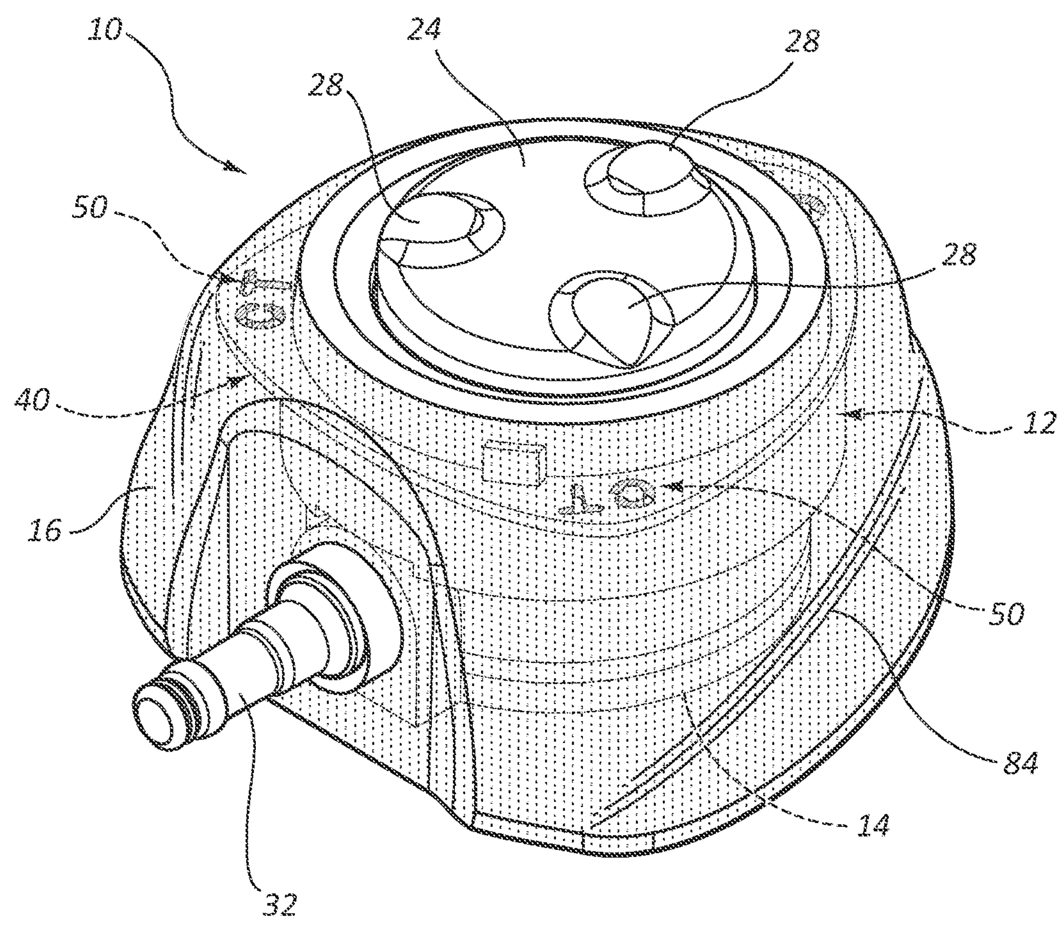

FIG. 7

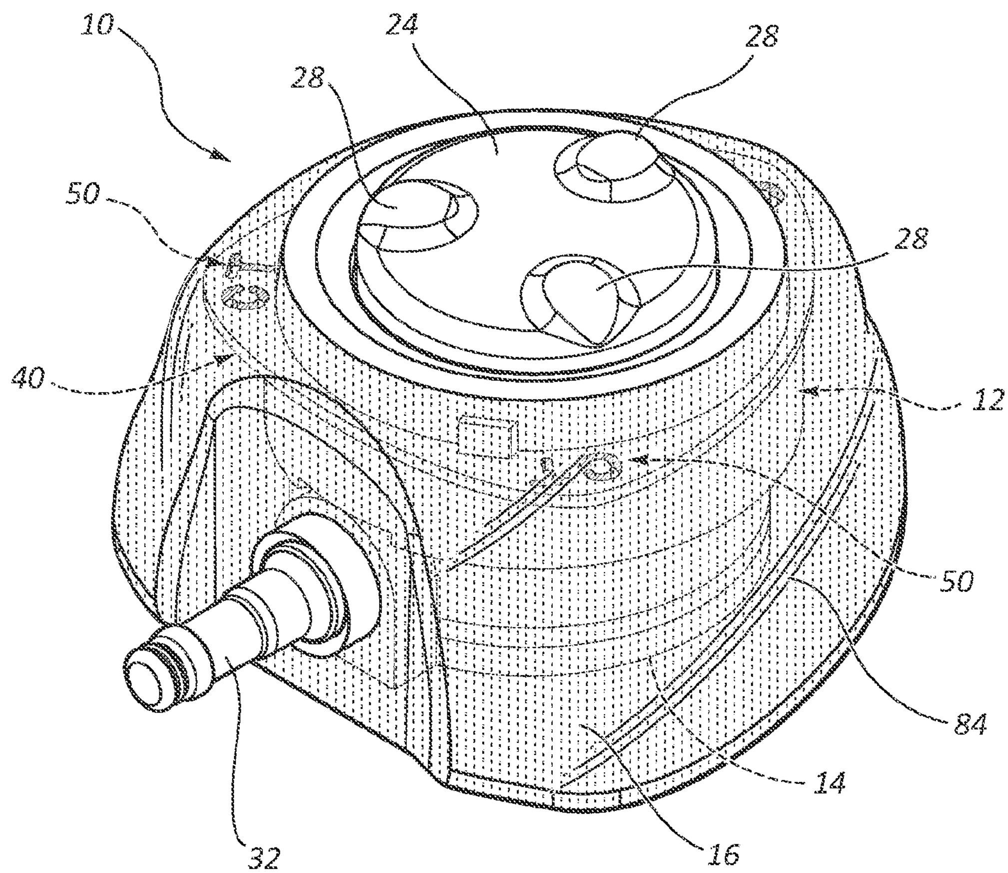

FIG. 8

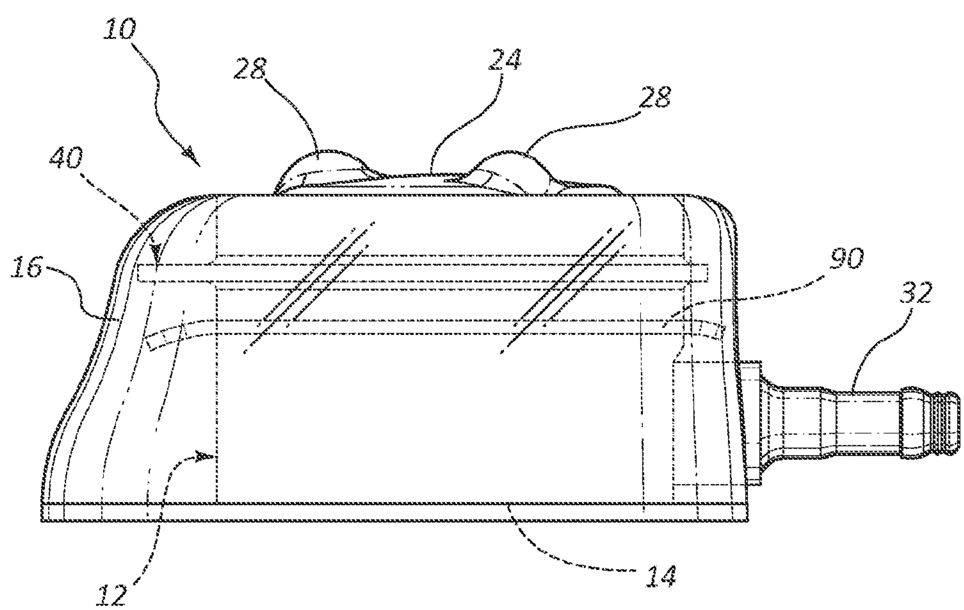

FIG. 9

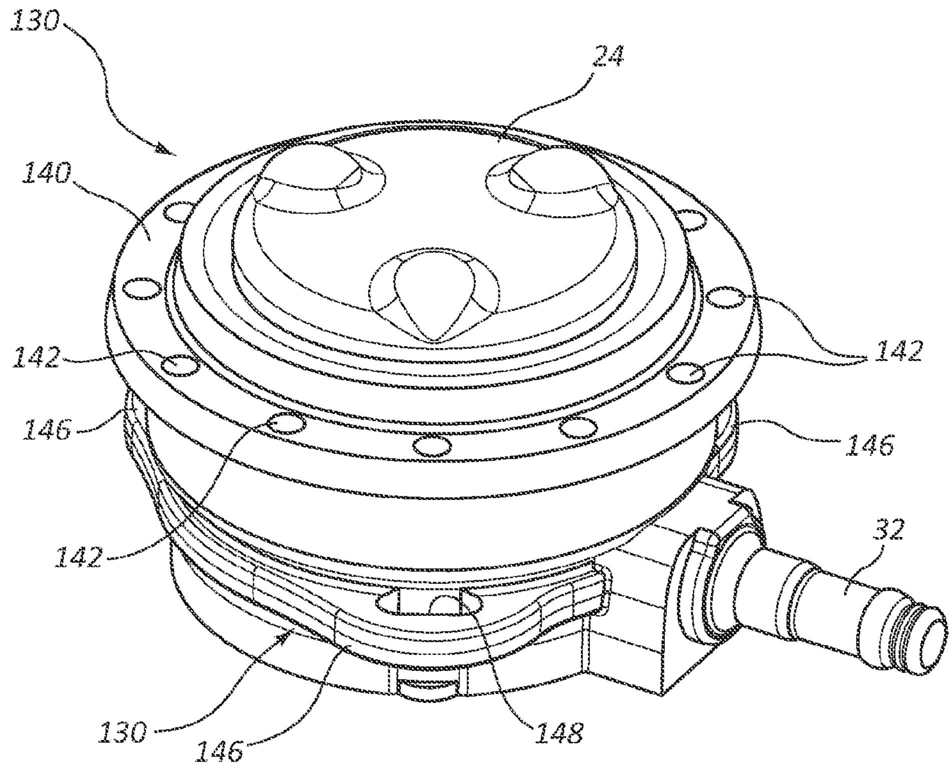
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FIG. 10

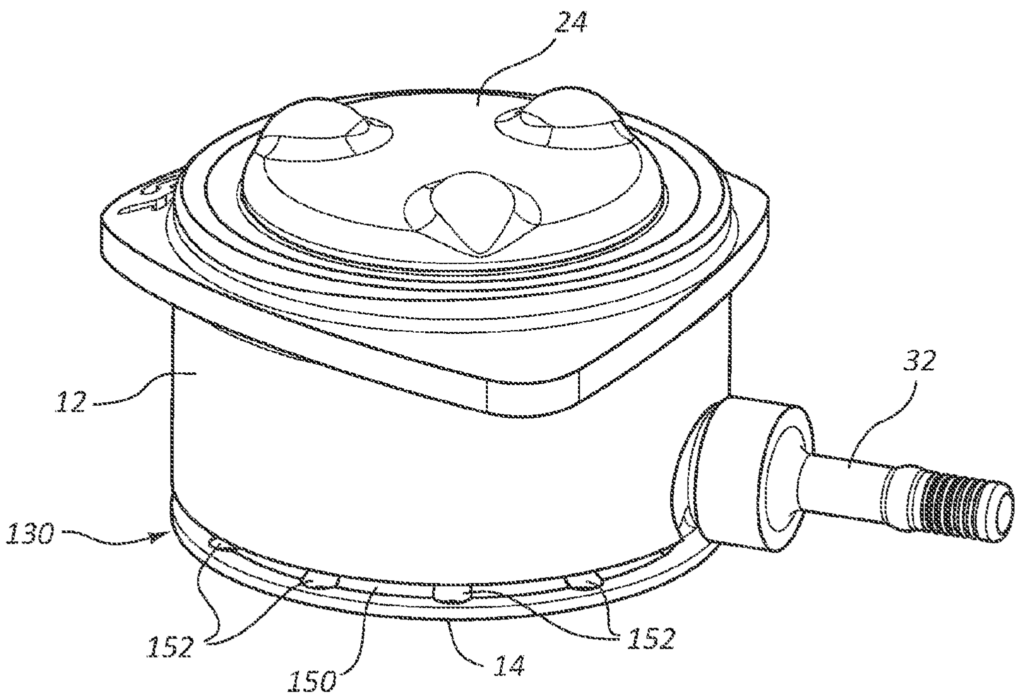
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FIG. 11

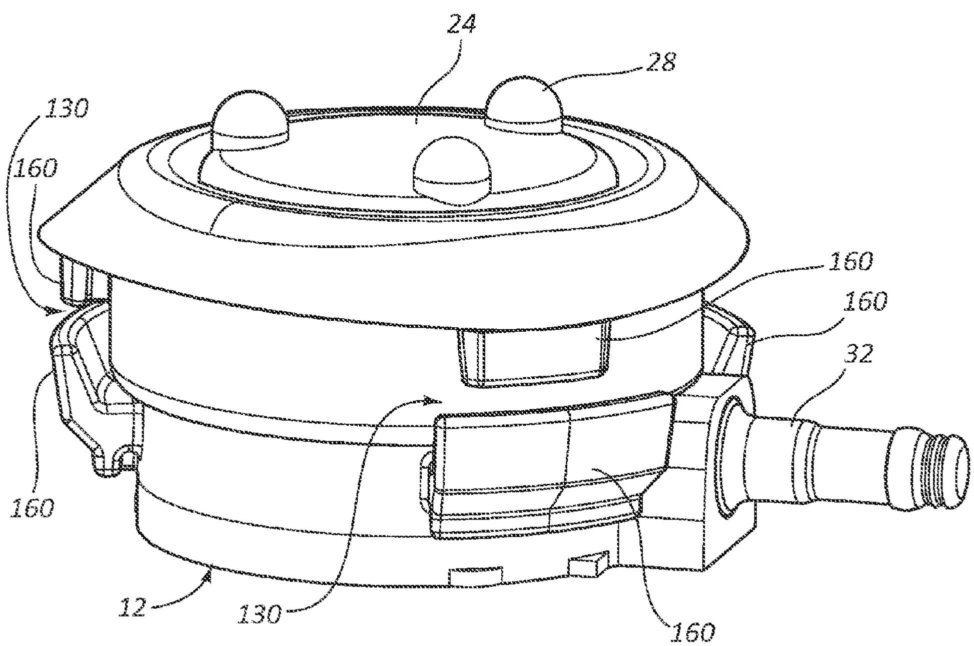

FIG. 12

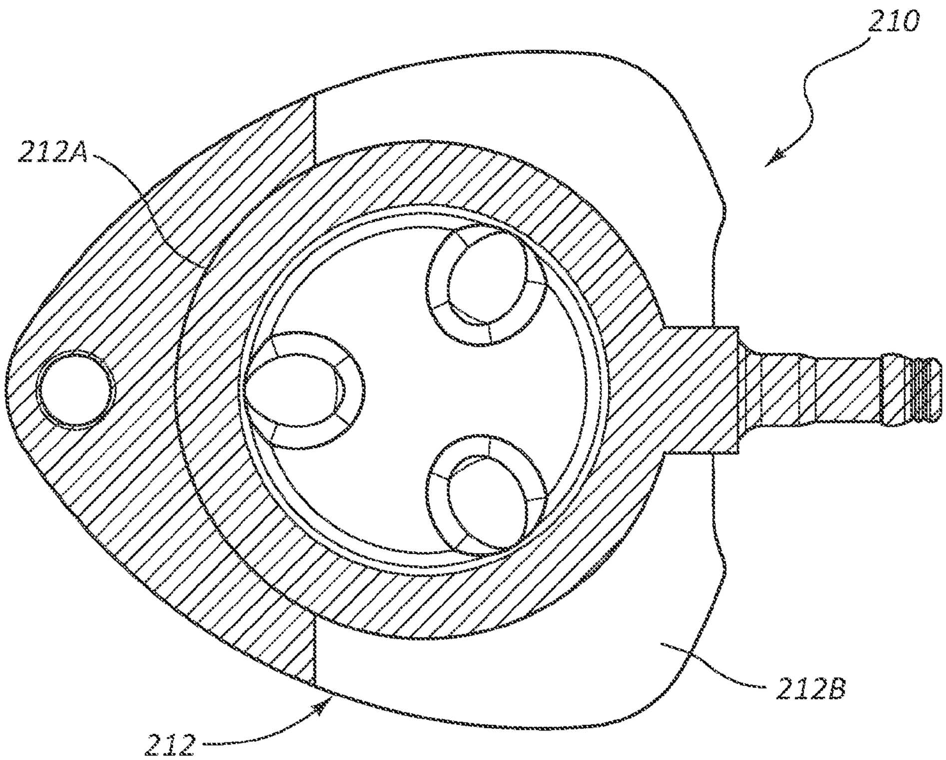

FIG. 13A

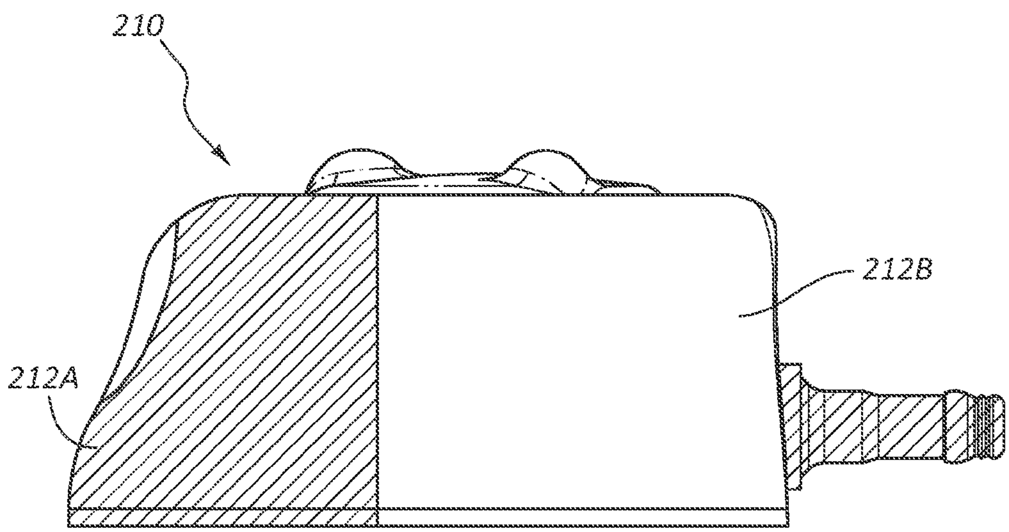

FIG. 13B

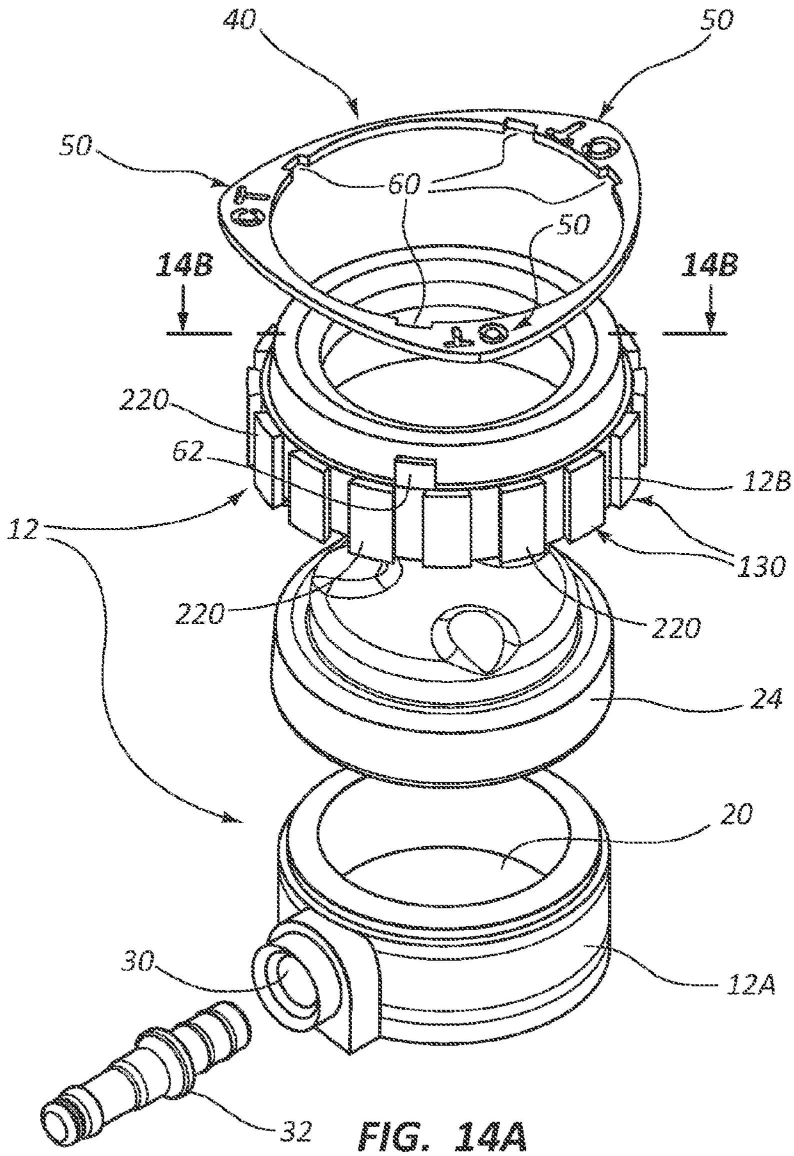

FIG. 14A

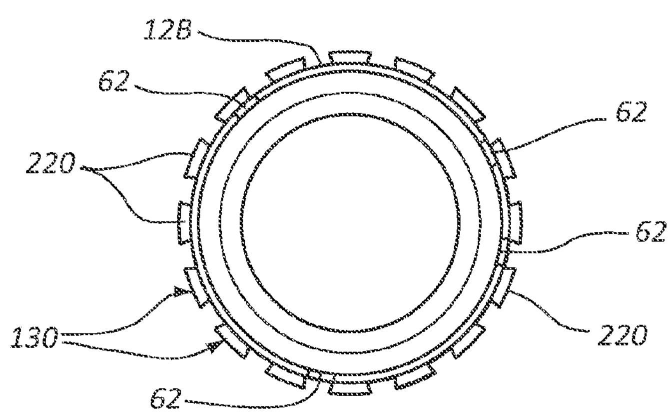

FIG. 14B

OVERMOLDED ACCESS PORT INCLUDING ANCHORING AND IDENTIFICATION FEATURES

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a division of U.S. application Ser. No. 12/917,323, filed Nov. 1, 2010, now U.S. Pat. No. 9,079,004, which claims the benefit of U.S. Provisional Application No. 61/262,126, filed Nov. 17, 2009, each of which is incorporated herein by reference in its entirety.

BRIEF SUMMARY

Briefly summarized, embodiments of the present invention are directed to an access port for providing subcutaneous access to a patient. In particular, in one implementation the access port is implanted in the patient's body, then is fluidly connected to a catheter that has been introduced into the patient's vasculature. So positioned and configured, the access port can be transcutaneously accessed by a needle or other infusion/aspiration device so as to administer medicaments to the patient's vasculature via the port and catheter, or to aspirate blood or other fluids therefrom.

In one embodiment, the port includes an internal body defining a fluid cavity that is accessible via a septum. A compliant outer cover including silicone is disposed about at least a portion of the body. A flange is included with the port body and is covered by the outer cover. The flange radially extends about a perimeter of the port body proximate the septum so as to impede penetration of a needle a substantial distance into the outer cover, such as in instances where the needle misses the septum while attempting to access the port.

In one embodiment, the flange of the access port can further include both an anchoring feature for securing the outer cover to the port body and an identification feature observable via x-ray imaging technology for conveying information indicative of at least one attribute of the access port. The outer cover also provides a suitable surface for application of an antimicrobial/antithrombotic coating.

These and other features of embodiments of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of embodiments of the invention as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

A more particular description of the present disclosure will be rendered by reference to specific embodiments thereof that are illustrated in the appended drawings. It is appreciated that these drawings depict only typical embodiments of the invention and are therefore not to be considered limiting of its scope. Example embodiments of the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

FIGS. **1**A-**1**D are various views of an implantable overmolded access port according to one embodiment;

FIGS. **2**A-**2**D are various views of the access port of FIGS. **1**A-**1**D with the overmolding removed;

FIGS. **3**A-**3**E are various views of an implantable overmolded access port according to one embodiment;

FIG. **3**F is a bottom view of an access port body according to one embodiment;

FIG. **4** is a top view of a port flange for use with the access port of FIGS. **3**A-**3**E;

FIG. **5** is a top view of a port flange according to one embodiment;

FIGS. **6**A-**6**C are various views of a port flange and related components according to one embodiment;

FIG. **7** is a perspective view of an implantable overmolded access port according to one embodiment;

FIG. **8** is a perspective view of an implantable overmolded access port according to one embodiment;

FIG. **9** is a cross sectional view of an implantable access port including an identification feature according to one embodiment;

FIG. **10** is a perspective view of a body portion of an implantable access port including anchoring features according to one embodiment;

FIG. **11** is a perspective view of a body portion of an implantable access port including anchoring features according to one embodiment;

FIG. **12** is a perspective view of a body portion of an implantable access port including anchoring features according to one embodiment;

FIGS. **13**A-**13**B are various views of an implantable access port including a complaint body portion according to one embodiment; and

FIGS. **14**A-**14**B are various views of an implantable access port body including anchoring features according to one embodiment.

DETAILED DESCRIPTION OF SELECTED EMBODIMENTS

Reference will now be made to figures wherein like structures will be provided with like reference designations. It is understood that the drawings are diagrammatic and schematic representations of exemplary embodiments of the present invention, and are neither limiting nor necessarily drawn to scale.

For clarity it is to be understood that the word "proximal" refers to a direction relatively closer to a clinician using the device to be described herein, while the word "distal" refers to a direction relatively further from the clinician. For example, the end of a catheter placed within the body of a patient is considered a distal end of the catheter, while the catheter end remaining outside the body is a proximal end of the catheter. Also, the words "including," "has," and "having," as used herein, including the claims, shall have the same meaning as the word "comprising."

FIGS. **1**A-**14**B depict various features of embodiments of the present invention, which are generally directed to an access port for providing subcutaneous access to the body of a patient. In particular, in one implementation the access port is implanted in the patient's body, then is fluidly connected to a catheter that has been introduced into the patient's vasculature. So positioned and configured, the access port can be transcutaneously accessed by a needle or other infusion/aspiration device so as to administer medicaments to the patient's vasculature via the port and catheter, or to aspirate blood or other fluids therefrom.

Further, in embodiments to be described herein, the access port includes a compliant outer cover that increases patient comfort upon implantation and provides for enhanced options for suturing or otherwise securing the port within the patient's body. In addition, the compliant outer cover in one embodiment includes a biocompatible material such as silicone that provides a suitable surface on which an antimicrobial and/or antithrombotic coating can be applied in order to reduce patient risk or infection as a result of implantation of the access port. Additional features of the access port include, in one embodiment, identification features for identifying an attribute of the port via x-ray imaging, and anchoring features for securing the outer cover to the internal port body.

Reference is first made to FIGS. **1A-2D**, which show various views of an implantable access port ("port"), generally designated at **10**, according to one embodiment. As shown, the port **10** includes an internal body **12** that defines a bottom surface **14** and a fluid cavity **20** (FIG. **2A**). An outer cover **16**, to be discussed further below, is disposed about the body **12** to substantially cover it, with the exception of an opening **22** to the fluid cavity **20** and a penetrable septum **24** that is placed in the opening to cover the fluid cavity.

In greater detail, the septum **24** in the illustrated embodiment is held in place within the opening **22** of the fluid cavity **20** by a retaining ring **26** that is inserted into the opening **22** to engage the port body **12** in an interference fit. The outer cover **16** covers the surface of the body **12** of the port **10** up to a circular region about the retaining ring **26**, as best seen in FIG. **1C**. The outer cover can include other configurations in addition to what is explicitly shown in the accompanying figures.

In the present embodiment, the body **12** of the port **10** includes titanium or other suitable metallic material. In other embodiments to be described herein, the port body includes non-metallic materials. Additional details of the port **10** include a plurality of palpation features **28** included on a top surface of the septum **28** to assist in identification of the port after subcutaneous placement, and a fluid outlet **30** in fluid communication with the fluid cavity **20**. A stem **32** defining a conduit is fixedly received within the fluid outlet **30** so as to provide a fluid pathway between the fluid cavity **20** and a catheter attached to the stem.

As mentioned, the outer cover **16** includes a compliant material and covers the port body **12**. In one embodiment, the outer cover **16** includes silicone of 30 Shore A durometer, a biocompatible material, though it is appreciated that other suitable biocompatible and compliant materials can also be employed, including thermoplastic elastomers. Due to its compliant nature, the outer cover **16** provides increased comfort for the patient's body when implanted therein. Additionally, the outer cover **16** is pierceable by a needle to enable sutures to be secured through any number of locations in the outer cover to facilitate ease of securing the port within the patient's body.

Furthermore, the compliant outer cover **16** in one embodiment provides a suitable surface for the application of one or more coatings for the part **10**. This is true in cases, for instance, where the port body **12** includes titanium or other metal, or an acetyl resin sold under the name DELRIN™, materials where coatings have been traditionally relatively difficult to adhere to.

In one example embodiment, an antimicrobial and/or antithrombotic coating(s) can be applied to the surface of the outer cover **16** in order to prevent the growth of microbes and/or formation of thrombus on or around the port **10**. Non-limiting examples of coatings that may be applied to the outer cover **16** of the port **10** can be found in the following: U.S. Patent Application Publication No. 2007/0003603, filed Aug. 1, 2005, and entitled "Antimicrobial Silver Compositions;" U.S. Application Publication No. 2007/0207335, filed Feb. 8, 2007, and entitled "Methods and Compositions for Metal Nanoparticle Treated Surfaces;" and U.S. Application Publication No. 2007/0293800, filed Apr. 25, 2007, and entitled "Antimicrobial Site Dressings." Further coating examples can be found in the following: U.S. Pat. No. 6,808,738, entitled "Method of Making Anti-Microbial Polymeric Surfaces;" U.S. Pat. No. 6,475,516, entitled "Drug Delivery via Therapeutic Hydrogels;" and U.S. Patent Application No. 2004/0086568, filed Feb. 26, 2002, and entitled "Method of Making Anti-Microbial Polymeric Surfaces." Each of the afore-mentioned patents and applications is incorporated herein by reference in its entirety. Other coatings can also be employed as may be appreciated by one skilled in the art.

In one embodiment, an antimicrobial coating applied to the outer cover includes silver and further includes a component to prevent apparent discoloration of the outer cover, such as a dye component commonly known as Brilliant Green, CAS number 633-03-4. In yet another embodiment, an antimicrobial, antithrombotic, or other suitable material can be added to the outer cover materials and configured to elute therefrom at a desired rate in order to provide desired properties to the surface of the outer cover. The outer cover in one embodiment can be colored to fall within a specific color range on the PANTONE® Matching System (Pantone Inc., Carlstadt, N.J.), such as Pantone 3272M and proximate colors, for instance.

Note that the body **12** and the retaining ring **26** of the port **10** shown in the present embodiment of FIGS. **1A-2D** include titanium. In some embodiments described below, other materials are employed for the port body. It should be remembered that, in addition to what is disclosed herein, other suitable materials can be employed for the various components of the port without departing from the spirit of the embodiments described herein.

In accordance with one embodiment, the port **10** further includes a flange **40** that extends radially about a perimeter of the body **12** of the port. As best seen in FIG. **1B**, the flange **40** is positioned circumferentially about and proximate to the septum **24** and opening **22** of the fluid cavity **20**. So configured, the flange **40** functions as a needle guard for preventing penetration by a needle or other infusion/aspiration device into a portion of the outer cover **16** relatively close to the septum **24** of the port **10**. This in turn prevents a user of the needle from penetrating the compliant outer cover **16** and thus believing the needle has accessed the septum **24**, which in one embodiment also includes a complaint material such as silicone. In such a case, needle penetration into the outer cover by the user will be impeded by the flange **40**, which will indicate to the user the need to re-insert the needle to access the septum **24**, thus preventing further problems. It is appreciated that in the present embodiment the flange is formed integrally with the port body and thus includes titanium. In other embodiments, however, the flange can be separately manufactured, can include other suitable materials, can extend from other areas of the port body other than proximate the septum, and can include different shapes and configurations.

In one embodiment, the flange **40** also serves to enable identification of the port as including a particular characteristic or attribute. For instance, the flange **40** can include one or more identification features that are observable via x-ray or other similar imaging technology so as to enable identification of a corresponding attribute of the port after implantation thereof into the body of the patient. One example of an attribute that can be indicated by the identification feature is the ability of the port to participate in the infusion of fluids therethrough at a relatively high flow rate, commonly referred to as power injection. Such power injectability is useful, for instance, when injecting contrast media through the port **10** in connection with computed tomography ("CT") imaging procedures on the patient's body. Power injection flow through the port in one example is performed at a rate of about zero to five milliliters per second, though this can vary according to a number of factors.

In accordance with the above, the port flange **40** in one embodiment includes one or more identification features **50**, best seen in FIGS. 1C, 1D, and 2D. In particular, the identification features 50 of the present embodiment include alphanumeric indicia 52 that are defined in the body of the flange 40. In greater detail, the flange 40 in the present embodiment includes a set of three alphanumeric indicia 52, wherein each indicium includes the letters "CT" defined through the thickness of the flange so as to provide a radiographic contrast between the CT holes and the surrounding body of the flange when the port is imaged via x-ray. The orientation of the "CT" letters is such that observation thereof in an x-ray will indicate whether the port is properly positioned and oriented within the body of the patient.

It is contemplated that the identification features 50 described above can be one or more alphanumeric characters, such as the "CT" depicted in FIGS. 1A-2D. Additionally, the instant disclosure contemplates the use on the flange of other markings, such as one or more symbols, patterns, characters, designs, a combination thereof, etc. The identification feature(s) can be of any size, shape, or both in order to tailor the identification feature for the specific identification of one or more of a variety of attributes of the access port. Specifically, in one embodiment the identification feature(s) can convey information to a practitioner regarding the power-injectability of the implanted port, as has been discussed. Other examples of attributes the identification feature can convey include port type, catheter type, date of manufacture, lot number, part number, etc. In other embodiments, the identification feature can be defined in other ways.

In one embodiment, the flange 40 serves yet another function as an anchoring feature in securing engagement between the port body 12 and the outer cover 16. As mentioned above, the alphanumeric indicia ("CT") 52 in the present embodiment are defined as holes through the thickness of the flange 40, which flange is included with the internal body 12 of the port 10. During manufacture of the port 10, the outer cover 16 of the envelops the port body 12 via an overmolding process, wherein silicone or another suitable, flowable material is injected into a mold containing the port body 12 such that the silicone envelops the majority of the port body, including the flange 40. The silicone is then allowed to cure to form the outer cover 16. During the overmolding process, the flowable silicone flows through the holes of the CT indicia 52 and remains therein after curing is complete such that a bond in and through the CT holes is defined by the silicone, thus anchoring the outer cover 16 as a single piece to the port body 12 and preventing separation therebetween.

As will be seen further below, the anchoring features as described here can be modified from what is shown in FIGS. 1A-2D. In one embodiment, an adhesive can be used to adhere the outer cover 16 to the port body 12, especially about the circular termination of the outer cover proximate the port body opening 22. Adhering the outer cover in this area can serve to prevent seepage under the outer cover 16 of any coatings or layers applied to the external surface of the outer cover. Examples of suitable adhesives are available from NuSil Technology LLC of Carpinteria, Calif.

As best seen in FIG. 1D, in one embodiment, an insert 56 including the same material as the outer cover 16 is affixed to the bottom surface 14 of the internal port body 12 before overmolding of the outer cover occurs. The purpose of the insert 56 is to help stabilize and secure the internal port body 12 within the mold before the outer cover is overmolded on to the body. In one embodiment, both the outer cover 16 and the insert 56 include silicone such that both integrate together during the overmolding process. In another embodiment shown in FIG. 3F, a disk 70 including a suitable radiopaque material, such as titanium, can replace the insert 56 on the bottom surface 14 of the internal port body 12 and can include an identification feature 50 observable via interaction with x-ray imaging apparatus such that a characteristic or attribute of the port can be identified after implantation. In the illustrated embodiment, the disk includes alphanumeric cutouts of the letters "CT."

FIGS. 3A-3E depict various views of the port 10 according to another embodiment, wherein the internal body 12 of the port includes a thermoplastic, such as an acetyl resin commonly sold under the name DELRIN™. As best seen in FIG. 3B, the port body 12 includes a base 12A and a cap 12B that are mated together via ultrasonic welding or other suitable process to define the fluid cavity 20 and to capture therebetween the septum 24. As such, no retaining ring is employed as in the metallic port of the previous embodiment of FIGS. 1A-2D.

The port 10 of FIGS. 3A-3E includes the flange 40 as a separately manufactured component that is attached to the body 12 of the port 10. Specifically, and with additional reference to FIG. 4, the flange 40 of the present embodiment includes a central hole 40A to enable the flange to receive the port body 12 therethrough and to sit atop a ledge defined on the cap 12B, as best seen in FIGS. 3B and 3C. A plurality of notches 60 are defined about the perimeter of the central hole 40A of the flange 40 and correspond with a plurality of extending tabs 62 included on the cap 12B on the ledge thereof. The notches 60 and corresponding tabs 62 are keyed relative to one another so as to enable the flange 40 to seat in only the correct orientation atop the ledge, that is, to ensure the alphanumeric indicia are positioned in the correct orientation with respect to the port.

In the present embodiment, after the flange 40 has been properly positioned on the cap 12B during manufacture as shown in FIG. 3C, the notches 60 thereof will be seated over the tabs 62 of the cap. The tabs 62 can then be deformed by a melting, mechanical, or other suitable deformation process so as to lock the flange 40 on the cap 12B and prevent its removal therefrom.

As mentioned, FIG. 4 shows further details of the flange 40, including the alphanumeric indicia 52 of each identification feature 50, the central hole 40A, and the notches 60. Note that in the present embodiment, the flange includes titanium and the outer perimeter of the flange 40 generally defines a bulged triangle with a corresponding one of the alphanumeric indicia 52, which indicia serve as both identification features and anchoring features for securing the outer cover 16 to the port body 12, positioned at each of the vertices of the triangle. The "CT" indicia 52 are formed in the flange 40 in one embodiment by wire EDM cutting, though other acceptable methods can also be employed including stamping, molding, etc. It is appreciated that the size, shape, and composition of the flange, together with the configuration of the identification features, can vary from what is shown and described herein. For instance, other suitable materials the flange may include can be found in U.S. Pat. No. 8,029,482, titled "Systems and Methods for Radiographically Identifying an Access Port," which is incorporated herein by reference in its entirety.

FIGS. 5-9 show details of additional embodiments relating to the flange 40. FIG. 5 shows the flange 40 according to one embodiment, wherein the identification features 50—here represented as the alphanumeric indicia 52—are not defined through the entire thickness of the flange, but are only defined partially therethrough so as to form recessed features. In one embodiment, the indicia 52 are defined to a depth in the flange 40 of about 0.015 inch, the flange including a total thickness of about 0.020 inch, though other depths and flange thicknesses are possible. This enables the "CT" indicia 52 to be viewed visually (before implantation) only when the port **10** is viewed from a top-looking-down perspective, such as the perspective shown in FIGS. **1**C and **3**D. Further, the CT indicia **52** formed in this manner provide sufficient radiographic contrast to enable the indicia to be imaged via x-ray imaging after port implantation, thus serving the desired role as identification features for the port **10**. The indicia **52** can be formed by wire EDM machining, laser etching, etc. In addition, a plurality of through holes **76** is defined through the thickness of the flange **40** to serve as anchoring features for the flange. The flange **40** is positioned similarly to that shown in FIGS. **1**A-**3**E.

Note that in the above embodiment and in selected embodiments to follow, the identification features for identifying an attribute of the port are configured such that they are visually viewable (e.g., before implantation) from only predetermined perspectives, such as a top-looking-down perspective shown in FIG. **5** for instance. Such limited perspective visual viewing of the identification feature is useful in one embodiment to indicate to a clinician the top of the port; that is, when the port is placed top-side-up, the identification feature can be visually identified, indicating a proper orientation for inserting the port into the body of the patient. When the port is upside-down, however, the identification feature is not visually observable, thus indicating to the clinician that the port is upside-down. This feature can thus serve to eliminate confusion for the clinician as to the proper orientation of the port. In addition, it is appreciated that in one embodiment, all or a portion of the outer cover of the port can be made opaque so as to eliminate the possibility for a clinician to mistake the CT indicia cutouts of the flange for suture holes through which sutures are to pass.

FIGS. **6**A-**6**C show the flange **40** according to another embodiment, wherein the "CT" alphanumeric indicia **52**, each serving as the identification feature **50**, are defined as cutouts through the thickness of the flange, as in previous embodiments. A compliant, opaque triangular plug **80** defining the letters "CT" in raised relief to correspond with the "CT" of each of the indicia **52** is inserted into the "CT" cutout of each of the indicia so as to be retained thereby. So positioned, the plug enables the "CT" indicia **52** to be viewed visually (before implantation) only when the port **10** is viewed from a top-looking-down perspective, such as the perspective shown in FIGS. **1**C and **3**D. When visually viewed from the port bottom, the plug prevents the respective indicia **52** from being observed. Instead, the shape of the plug bottom, a triangle in the present embodiment, is seen. Note that the shape of the plug can vary, as can the raised relief on a top surface thereof in order to correspond with the cutout design of the indicia into which the plug is to be inserted.

FIG. **7** shows the port **10** according to one embodiment, wherein the outer cover **16** of the port includes a frosted surface **84** or otherwise obscured surface so as to render the outer cover opaque. The frosted surface **16** of the port **10** in one embodiment is achieved during the overmolding phase, wherein the surfaces of the mold used to overmold the outer cover **16** to the internal port body **12** include a roughened surface, achieved for instance via bead blasting of the mold surface. When the outer cover **16** is overmolded in such a mold, the frosted surface **84** of FIG. **7** results. It is appreciated that other suitable methods for providing a frosted or opaque surface to the outer cover **16** can also be employed. In yet another embodiment, only a bottom surface of the outer cover is frosted.

In another embodiment, a fabric or mesh structure can be incorporated/imbedded into the outer cover of the port so as to render it opaque. In yet another embodiment, instead of bead blasting, the mold surface can be treated to define thereon diamond-shaped mesh surface features that will impart to the port outer cover when molded therein a roughened, opaque surface. In yet another embodiment, logos or other features can be inscribed into the port outer cover, or included as surface features in the mold surface in which the outer cover is overmolded to the port body so as to render the outer cover at least partially opaque. These and other treatments for outer cover opacity are therefore contemplated.

FIG. **8** shows the port **10** according to one embodiment, wherein a colorant or other suitable opaque additive is included with the material that is used to form the outer cover **16**, e.g., silicone, so as to render the outer cover opaque. In one embodiment, a colorant such as Kreative Color Purple, K-6050-13, provided by Kreative Liquid Color of Ontario, Calif., is intermixed with the silicone before the overmolding process, resulting in an opaque outer cover **16** for the port **10** after overmolding is complete. Of course, other materials and methods can be employed to render the outer cover opaque. Desired characteristics of the colorant or opaque additive in one embodiment include radiotranslucence, biocompatibility, and compatibility with the material from which the outer cover is made.

FIG. **9** shows the port **10** according to another embodiment, wherein in addition to the flange **40**, a secondary plate **90** is positioned below the flange as shown in FIG. **9**. Like the flange **40**, the plate **90** is covered by the outer cover **16** and in one embodiment includes through holes to serve as an anchoring feature for securing the engagement between the outer cover **16** and the internal body **12** of the port **10**. Also like the flange **40**, the plate **90** can include titanium, bismuth trioxide or other suitable material, or can differ in composition from the flange **40**. Positioning of the plate **90** as shown in FIG. **9** limits visual observation of the indicia serving as identification features of the flange **40** to a top-looking-down point of view, as in FIGS. **1**C and **3**D.

FIGS. **10**-**12** depict various embodiments disclosing additional examples of anchoring features for the internal body **12** of the port **10**. The anchoring features to be described operate similar to the "CT" indicia cutouts and other anchoring features of the flange **40** described in the above embodiments in securing the overmolded outer cover to the internal port body.

In FIG. **10**, anchoring features **130** are included on a flange **140** of the port body **12**. The flange **140** is positioned circumferentially about and proximate to the septum **24** included on the port body **12**. In particular, the anchoring features are implemented as a plurality of through holes **142** defined through the flange **140**. In addition, one or more extensions **146** extend from the port body **12** below the flange **140** a sufficient distance to define additional through holes **148**. As has been described relating to this and other embodiments herein including anchoring features, the silicone or other suitable material used to form the outer cover flows about the internal body **12** of the port during the overmolding process, passing through the anchoring features **130** to desirably enhance the adhesion of the outer cover to the port body.

FIG. **11** shows another example of an anchoring feature **130** for the port body **12**, wherein an annular groove **150** is defined proximate the bottom **14** of the port body **12**. A plurality of through holes **152** is defined in the groove so as to extend from the groove to the port body bottom surface **14** to enable flow therethrough of the outer cover material during the overmolding process.

FIG. **12** depicts yet another example of anchoring features **130**, wherein a plurality of teeth **160** extends from surfaces of the port body **12**. In particular, opposing pairs of teeth **160** are shown extending toward one another in FIG. **12**, providing a gap not only between opposing teeth, but between the teeth and the adjacent side surface of the port body **12** so as to provide a suitable space through which the outer cover material can flow before solidifying after overmolding to anchor the outer cover to the port body. The size, shape, number, and position of the teeth can vary in a number of ways. More generally, it is appreciated that the preceding embodiments are merely examples of anchoring features and that other types and configurations of anchoring features can reside within the principles of the embodiments of the present invention.

FIGS. **13**A and **13**B depict a port **210** according to one embodiment, wherein a body **212** of the port includes a first body portion **212**A defining a nose of the body and a second body portion **212**B defining the remaining portion of the body. In the present embodiment, the first body portion **212**A includes a relatively rigid biocompatible material, such as acetyl resin or other thermoplastic, while the second body portion **212**B includes a compliant overmolded material, such as silicone or other suitable biocompatible material. So configured, the port body nose defined by the first body portion **212**A is relatively rigid to assist in placement of the port into a pocket defined in the tissue of the patient, while the remainder portion of the port body **212** defined by the second body portion **212**B is compliant to increase patient comfort and to increase suturability of the port **210**. Overmolding of the second body portion can be achieved in a manner similar to previous embodiments.

FIGS. **14**A and **14**B depict yet another example of anchoring features **130**, wherein a plurality of dovetail extensions **220** extends from the circular side surface of the port body cap **12**B about the circumference thereof. The dovetail extensions **220** provide ample surface area and entrapment areas between adjacent dovetails through which the outer cover material can flow before solidifying after overmolding to anchor the outer cover to the port body. The size, shape, number, position, and spacing of the dovetails teeth can vary in a number of ways. For instance, in addition to their inclusion on the port cap, the dovetail extensions could be included on the port base. Also, though shown extending about the entirety of the port cap circumference, in one embodiment the dovetail extensions could be defined only partially thereabout. These and other variations are contemplated.

Embodiments of the invention may be embodied in other specific forms without departing from the spirit of the present disclosure. The described embodiments are to be considered in all respects only as illustrative, not restrictive. The scope of the embodiments is, therefore, indicated by the appended claims rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

1. A method for manufacturing an access port for providing subcutaneous access to a patient, the method comprising:

forming a port body defining a fluid cavity to be accessible via a septum coupled to the port body, the forming including bonding a cap to a base, the septum captured between the cap and the base, the cap including a first keyed feature;

forming a flange including an anchoring feature, the flange including a second keyed feature corresponding to the first keyed feature of the cap;

attaching the flange to the port body proximate the septum, the attaching including aligning the second keyed feature with the first keyed feature; and

covering at least the flange with a compliant outer cover such that the outer cover envelops the anchoring feature included on the flange to anchor the outer cover to the port body.

2. The method for manufacturing an access port according to claim **1**, wherein the first keyed feature is a tab and the second keyed feature is a notch, and the attaching comprises deforming the tab to lock the flange to the cap.

3. The method for manufacturing an access port according to claim **1**, further comprising applying a coating to the outer cover, the coating including at least one of an antimicrobial and an antithrombotic component.

4. The method for manufacturing an access port according to claim **1**, wherein covering at least the flange further comprises overmolding the outer cover about a majority portion of the port body, the outer cover including silicone.

5. The method for manufacturing an access port according to claim **4**, wherein at least a portion of a surface of the outer cover includes a frosted surface to prevent visual observation therethrough.

6. The method for manufacturing an access port according to claim **1**, wherein forming the flange comprises including an identification feature observable via x-ray imaging technology, the identification feature conveying information indicative of at least one attribute of the access port.

7. The method for manufacturing an access port according to claim **6**, wherein the identification feature indicates the access port is capable of power injection.

8. The method for manufacturing an access port according to claim **1**, wherein the anchoring feature is formed as an identification feature observable via x-ray imaging technology, the identification feature conveying information indicative of at least one attribute of the access port.

9. The method for manufacturing an access port according to claim **8**, wherein the identification feature indicates the access port is capable of power injection.

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